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Autor(in)/ author:	Stig Eliasson
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STIG ELIASSON:

Old Danish vigesimal counting: A comparison with Basque[1]

Vigesimal or twenty-based counting – the use of composite numerals whose arithmetic base is twenty – is scattered over several different parts of the world, sometimes appearing in a relatively pure form, but usually mixed with other types of counting, most often a decimal system.[2] Proto-Indo-European is considered to have been thoroughly decimal.[3] Nevertheless, twenty-based counting shows up in quite a few of its daughter languages, the best known western case being perhaps that of Old French.[4] In the Celtic languages, vigesimal counting is found in the Gaelic – Modern Irish, Scottish Gaelic, and Manx – as well as the Brittonic branch – Welsh, Cornish, and Breton – while literary Old Irish is decimal and the situation in Gaulish virtually unknown.[5] Old Norse and most Scandinavian languages utilize the decimal system, with Old Norse preserving the practice of counting in ›long hundreds‹, i.e., the word *hundrað* commonly means ›120‹ and *þúsund* ›1200‹.[6] A special characteristic of Danish, however, is its incorporation of parts of a vigesimal system, emerging in the preserved records around 1300 A.D. in Jutland and during the course of the 14th century spreading to the whole of Denmark. Brøndum-Nielsen summarizes the development as follows:[7]

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1 I am indebted to Allan Karker for a thorough reading of an earlier version of this paper. Elmar Ternes kindly checked the Celtic data.

2 COMRIE: 2005, 530, 531.

3 SZEMERÉNYI: 1960; 1990, 234.

4 NYROP: 1924, 362–364; PRICE: 1992, 463–466.

5 GREENE: 1992, 499–500. and passim; MACAULAY: 1992a, passim; DELAMARRE: 2003, 430, 302.

6 Cf., e.g., KARKER: 1993, 441; JUSTUS: 1996; 1999, 72.

7 All translations and bracketed insertions in this paper are by SE. The following notations will be used for representing the structure of morphemically complex numerals: × overt multiplication marker (morpheme or combination of morphemes), · multiplication expressed merely by order of multiplier and multiplicand, + overt addition marker, & addition expressed by order of addend and augend (i.e., augmented number; GREENBERG: 2000, 774), ½ n^{th} ›half n^{th} decade‹, || ›double‹ as opposed to ›two times‹ (2× or 2·), and {n×} a single-word multiplicative numeral of the type ›thrice‹ {3×}. Spaces in orthographic forms are disregarded in the abbreviatory formulas, e.g., Old Danish *thry sinne tiwe* and *tryssyntywe* are both rendered as 3×20. * marks a reconstructed form or structure, < means ›derived from‹.

> In the written sources, the score counting system surfaces for the first time in the manuscript of the Danish text of the Flensborg municipal law (from about 1300) with the forms *fiyrsin tiughæ* [4×20, i.e., 80]…, *half fæmpt sin tiygh* [(½ 5th)×20, i.e., 90]…, whereas, at approximately the same time, East Danish manuscripts… use the decade forms *siutyugh* …, *siu tiugh*, *siu tiughæ* [70]…, following the same decade system as *thrætiughu*, *firitiughu* [30, 40]…, and so forth. But already our oldest diplomas in Danish – East Danish as well as West Danish – use throughout the score system in the numerals 50–90: *fire sin(ni) tiugho* [4×20, i.e., 80], *half thrithiæ sinnæ tiughu* [(½ 3rd)×20, i.e., 50], etc. [8]

Danish twenty-based counting is most often believed to constitute a spontaneous language-internal innovation in the Middle Ages rather than to have pre-medieval roots or a trigger in language-contact. In Faroese, the twenty-based numerals are straightforward borrowings from Danish.[9] Additionally, in Western Europe, twenty-based counting is typical of Basque (Euskara), the sole non-Indo-European language of the area. According to Greene, »Basque is the only European language in which the vigesimal system appears to be original«.[10]

The purpose of this paper is to compare, from a descriptive-typological point of view, the most salient features of vigesimal counting in Old Danish and Modern Basque.[11] Old Danish, taken in the sense of *gammeldansk*, as the latter term is being defined by Karker[12], extends from ca. 1100–1525, coinciding with the Middle Ages in Scandinavia.[13] Most early manuscripts in Danish, though, date from the period 1300–1350.[14] In contrast to Danish, Basque is documented in full-length texts only from the 16th century onwards: the first book published in Basque appeared in 1545, to be followed by the Basque translation of the New Testament in 1571. Its medieval attestation is restricted mainly to personal names, glosses, words, and toponyms in Latin and Romance sources. In particu-

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8 *GDG*, 207–208.

9 HAMMERSHAIMB: 1891, XCIV; ROSS and BERNS: 1992, 680–681; THRÁINSSON et al.: 2004, 113, 423.

10 GREENE: 1992, 540.

11 On numeral systems in general, see, e.g., HURFORD: 1975; 1987; GREENBERG: 1978; 2000; and HANKE: 2005, with references.

12 KARKER: 1996, 14.

13 A more restricted usage of the term Old Danish, ca. 1100–1350, is found in BANDLE: 2002–2005, corresponding to SKAUTRUP's: 1944–1968 Older Middle Danish (*Ældre Middeldansk*). For BRØNDUM-NIELSEN: 1950, 8–10, *Gammeldansk* in a wide sense embraces the period 800–1525.

14 FREDERIKSEN: 2002, 816, 821–823.

lar, few Basque numerals occur in the medieval records. The 11th–16th century materials excerpted by Arzamendi offer merely the Basque cardinals for ›one‹ through ›ten‹ as well as the ordinal *lehen* ›first‹.[15] Modern Standard Basque (*euskara batua* or Unified Basque) is a more or less normalized form of the language, based in the first place on Guipuscoan, but in part also on Labourdin and Low Navarrese. Since, in both Basque and Danish, vigesimality is intermingled with a decimal system, properties of the latter will be touched upon where pertinent to the main presentation.

The Old Danish and Modern Basque units, teens and decades

The Old Danish and Basque cardinals from ›one‹ to ›ten‹ are reproduced in Table 1.[16, 17] Old Danish preserves gender distinctions in digits 1–3 and partly in 4 (Scanian). Lacking grammatical gender, Basque makes no corresponding distinction. In both languages, the stems of the numerals 1–10 are synchronically opaque, constituting morphemically indivisible, mutually contrasting entities.[18] Hence, no simpler system than a decimal one can be discerned in either language.

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15 ARZAMENDI: 1985, 663.

16 The Old Danish numerals are discussed extensively by BRØNDUM-NIELSEN: 1962, 167–251. Short English summaries of Brøndum-Nielsen's data are given in ROSS and BERNS: 1992, passim. The Old Danish cardinals cited in this paper are spelling exemplars from miscellaneous manuscripts reproduced from BRØNDUM-NIELSEN: 1962, 168–230, without any attempt at normalization. As their phonological and orthographic variation is not immediately relevant to this paper, this is not considered here. See *GDG* for details.

17 The Basque numerals are, except where especially noted, those of Modern Standard Basque. AZKUE: 1969, 2:443–447, HUALDE and ORTIZ DE URBINA: 2003, 126–131, and PATRICK and ZUBIRI IBARRONDO: 2001, 31–32, 381–383, offer brief synchronic accounts. For Labourdin/Low Navarrese, see LAFITTE: 2001, 76–81, for miscellaneous Basque dialects HOLMER: 1964, 59–62. TRASK: 1997, 272–276, treats the numerals from a historical point of view. In addition, a vast array of recorded numeral forms is given at the respective places in the sixteen-volume *Diccionario General Vasco (DGV)*, published by the Royal Basque Language Academy, Euskaltzaindia, in the years 1987–2005. Orthographic *h*, used in the standard orthography promoted by Euskaltzaindia, is silent in Spanish Basque, but not in the French Basque zone. Basque examples cited in the paper retain the spelling of the original sources, which means that, for instance, the word for ›ten‹ may be written *hamar* or *amar*, the word for ›hundred‹ *ehun* or *eun*, etc.

18 Etymologically, the Basque word for ›nine‹, *bederatzi*, has sometimes been assumed to derive from **bada* or **bade* ›one‹ plus an unknown element, cf. TRASK: 1997, 273. Also *DGV*, 4:363, states that it is »[r]elacionado probablemente con *bedera* [›one each‹] y, por tanto, [también] con *bat*«.

Numerical value	*Old Danish*	*Basque*
1	en, et	bat
2	twa (Scanian *twe*), tu	bi (northern *biga*, when occurring as an independent noun phrase)
3	thre (Scanian *thri*), thry	hiru (northern *hiru(r)*)
4	fiuræ (Scanian *fire, firæ, fira*)	lau (northern *lau(r)*)
5	fæm	bost (eastern *bortz*)
6	sæx	sei
7	siu	zazpi
8	attæ	zortzi
9	ni	bederatzi
10	ti	hamar

Table 1: Numbers 1–10 in Old Danish and Basque. Major regional variants within parentheses. Northern (Basque) = French Basque

The decimal principle is also clearly evident in most of the cardinals 11–19, shown in Table 2.

Numerical value	*Old Danish*	*Structure of numeral*	*Standard Basque*	*Structure of numeral*
11	ællefue	11	hamaika	10[…?]
12	tolf	12	hamabi	10&2
13	thrættan	3&10	hamahiru	10&3
14	fiurtan	4&10	hamalau	10&4
15	fæmtan	5&10	hamabost	10&5
16	sæxtan	6&10	hamasei	10&6
17	siutan	7&10	hamazazpi	10&7
18	attan	8&10	hemezortzi	10&8
19	nittan	9&10	hemeretzi	10&9

Table 2: The cardinals 11–19 in Old Danish and Standard Basque

While in Old Danish the numerals *ællefue* and *tolf* are synchronically opaque[19], the numbers 13–19 are discernibly related to the simple units 3–9 with the addition of the element *-tan* ›-teen‹. The Basque teen series – apart from the obscure end part of *hamaika* ›eleven‹ – is patently transparent, constituting a combination of *hama-*, an allomorph of *hamar* ›ten‹, with a simple unit.[20] Hence, in each language, wherever transparent, numbers 11–19 are clearly based on the 1–10 system.

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19 On their history, cf. HELLQUIST: 1980, 181, 1201; *GDG*, 200.

20 MICHELENA: 1990, 496 surmises that *hamaika* may have originated in something like **hama–bed[e]–ka* ›ten–one–ADVERB SUFFIX‹ (cf. also ibid., 235). Likewise, in *DGV*, 1:864:

The decades 20–90 of the two languages are listed in Table 3, where the wide spectrum of Old Danish forms reflects the gradual transition to a new reorganized system.

	Old Danish	*Structure*	*Basque*	*Structure*
20	tiughu	20 (<*2 •10)	hogei (northern *hogoi*)	20
30	thrætiughu	3 •10	hogeita hamar	20+10
40	(a) fyritiughu (usual type) (b) fyresynne ty (c) tysuær tiugh (*GDG* 213)	4 •10 4×10 {2×}20	berrogei	‖20
50	(a) fæmtiughæ (b) halfthrithiasin(ni)tiugh(u) (c) halfthrithiæ tiugh (d) [halff thrøswendhe tiugh] (e) ti oc … firtiwæ	5 •10 (½ 3rd)×20 (½ 3rd)•20 (½ {3×}th)20 10+(4 •10)	berrogeita hamar	‖20+10
60	(a) sex tiuge (b) thry sinne tiwe (c) thry tiugh (d) tryswertyue (< thryswar) (e) ty oc halftrediæsinztyuæ	6 •10 3×20 3 •20 {3×}20 10+((½ 3rd)×20)	(a) hiruretan hogei (b) hirurogei	3×20 3 •20
70	(a) siu tiugh(æ) (b) syw synne thy (c) halffiærdesynne tiwæ (d) half fiærthæ tiwgh	7 •10 7×10 (½ 4th)×20 (½ 4th)•20	(a) hiruretan hogeita hamar (b) hirurogeita hamar	(3×20)+10 (3•20)+10
80	(a) attatige (b) fiyrsintiughæ	8 •10 4×20	(a) lauretan hogei (b) laurogei	4×20 4 •20
90	(a) niotighi (b) halffæmtæsintyugho	9 •10 (½ 5th)×20	(a) lauretan hogeita hamar (b) laurogeita hamar	(4×20)+10 (4•20)+10

Table 3: The decades 20–90 in Old Danish (Early and Late) and Basque

Originally, the Old Danish word for 20 derives from 2 •10 with first syllable loss (cf. Old Norse *tuttugu* 20 vs. Old Danish *tiughu*).[21] The etymon of its Basque counterpart *hogei* is unknown.[22] In both languages, all the decades above 20 are morphologically complex (contrast Russian *sorok* 40, Turkish *otuz* 30, *kırk* 40, *elli* 50, which are all synchronically monomorphemic). To express 50, 60, 70, Old Danish allows several possibilities: (a) decimal formations, (b) the construction ›half‹ plus ordinal and overt multiplication marker (½nth×), and (c) the construction ›half‹ plus ordinal

»No se sabe … cual es el último componente del numeral vasco, que podría ser complejo: **(c)e(c)–* (que podría ser *bed–*, cf. *bat*, *bedera*) + *–ka*, por ej.« For a summary of other interpretations, see TRASK: 1997, 274–275.

21 *GDG*, 208; ROSS and BERNS: 1992, 606.

22 Cf. GREENE: 1992, 540; TRASK: 1997, 275, 371.

without explicit multiplication marker (½nth•). For 60, there is also the type (d) *tryswertyue* (< the multiplicative adverb *thryswar* {3×} plus *tiugh*); for 50, *halff thrøswendhe tiugh*, a blend between the ½nth and the *thryswar* pattern, is recorded.[23] Moreover, for 50 as well as 60, (e) the pattern 10+augend occurs, including the striking formation for 60, *ty oc halftrediæsinztyuæ*, i.e., 10+((½ 3rd)×20), instead of the plain *thry sinne tiwe* 3×20. For the twenty-based expressions of 50–90, Old Danish generally preserves the full forms *halfthrithiasin(ni)tiugh(u)*, etc. In the modern language, these have been truncated to the rather opaque *halvtreds*, *tres*, *halvfjerds*, *firs*, *halvfems*.[24]

In comparison to Old Danish, the Modern Basque decades are admirably straightforward. The decade 40 is formed as ›double 20‹ (||20). The basic pattern for forming the decades 60, 80 is n•20 with the regional variant n×20. To express the uneven decades 30, 50, 70, 90, Basque simply adds to the nearest lower decade the overt addition marker *-ta* (< *eta* ›and‹) plus *hamar*.

In the following, we will elaborate on some of these differences between the Old Danish and Basque decade systems. The points addressed include (a) the Basque prefix *berr-* ›double‹, (b) the Danish ½nth construction to express uneven decades, (c) the ordering of addends and augends, (d) the types and occurrence of explicit multiplication markers, (e) the use of the additive series 1–9 or 1–19 with twenty-based numerals, and (f) the scope of vigesimal counting within the decades. Then, we will go into (g) vigesimal counting beyond the decades. A summary concludes the paper.

Basque *berr-* ›re-, again, double‹

As emerges from Table 3, the regular Old Danish word for ›forty‹, *fyritiughu*, is like *thrætiughu* ›thirty‹ formed by multiplication of the base 10 by means of a plain cardinal. In contrast, its Basque equivalent, *berrogei*, contains a morph *berr-* that diverges from the word for ›two‹, *bi*. The same morph, moreover, recurs in Basque *berrehun* 200, but not in ›two thousand‹ or ›two million‹, which are *bi mila* and *bi milioi*, respectively.

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23 The additional formation *tryswersintywe* {3×}×20 (*GDG*, 215, cf. also 190) constitutes a contamination of *thryswar* {3×} and the phrase *thrysin(ni)* 3×.

24 *Halvtreds*, phonetically [hal'tres], ›50‹, originating in an ordinal, is orthographically still rendered with a *d* as opposed to *tres* ['tres] ›60‹, which derives from a cardinal.

Not seldom are the words *berrogei* and *berrehun* explained simply as ›two times forty‹ and ›two times hundred‹, but it may be pertinent to note that the underlying conception is slightly different. Thus, Azkue describes *berr-* as a »[prefijo], muerto ya, que denota la duplicación« (adding, though, that »[s]e usa con más palabras su correspondiente BIRR-«).[25] In the same vein, Lhande notes that *beŕ-* (*ŕ* = *rr*; glossing after Lhande) is a

> préfixe indiquant une idée de redoublement, de répétition d'accroissement, dont la forme la plus usuelle est dans l'adv. *beŕiz*, *beŕitz* [›de nouveau, encore une fois‹], et qui se retrouve dans des mots tels que: *beŕa-* [›augmenter‹], *beŕegin* [›refaire, renouveler‹], *beŕehun* [›deux cents‹], *beŕerosle* [›rédempteur‹], *berhe-*, *b[e]rha-* [›augmenter, accroître‹], *beŕogei* [›quarante‹], etc…[26]

Drawing on the forms *biorrogei* 40, *biorrogeitamar* 50 of the 16th century, extinct, southern Basque dialect documented in Landuchio[27], Michelena derives the element *ber- ~ bir-*, which he translates as ›re-‹, from *bior*, *bi(h)ur* ›twisted‹, ›folded‹, with prefixal loss of *h*.[28] Similarly, Trask – following Michelena – states that »*berrogei* … exhibit[s] the common first element *berr-* < **bihur-* ›twist, bend‹, i.e. ›double‹« and that »[t]he prefix *ber- ~ bir-* ›re-, again‹ is clearly from *bihur* ›bend, twist‹«.[29] Aulestia and White, moreover, describe *berr-* as a »prefix which denotes repetition, duplication, doubling[, e]quivalent to the English prefixes bi-, re-«.[30] This use of a prefix in the Basque designation for ›forty‹ is a special twist of word-formation that shows up neither in Old French *deus vins* (2•20), nor in twenty-based Celtic forms for ›forty‹ such as Scottish Gaelic *dà-fhichead* (< *d(h)à* 2, *fichead* 20) or Breton *daou-ugent* (< *daou* 2, *ugent* 20). As far as Old Danish is concerned, since this language does not normally extend vigesimality as far down as 40 (the related multiplicative adverb formation *tysuær tiugh* {2×}20 appears to be decidedly marginal), it will have little occasion for a coinage of the type ||20.[31]

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25 AZKUE: 1905–1906, 156.

26 LHANDE: 1926, 151.

27 LANDUCHIO: 1562.

28 MICHELENA: 1990, 122, 411, 583.

29 TRASK: 1997, 275.

30 AULESTIA and WHITE: 1992, 55; cf. also ibid. 53 *ber–*, 65 *bir–*, 66 *birr–*, *bis*, 597 *re–* as well as AULESTIA: 1989, a45, 107, 122; and HUALDE and ORTIZ DE URBINA: 2003, 350.

31 Nor, for that matter, does it use the notion ›again, double‹ (||) with the numeral *hundrath(a)* 100, ›two hundred‹ being expressed as *tu hundræth*, *tuhundratha*, etc. (see *GDG*, 221–224).

The Old Danish device ›half‹ plus ordinal (½nth)

Using the same formula as in Old Icelandic *halfr fiórþe tegr* (½ 4th)•10 for 35, etc.,[32] Old Danish constructs the uneven decades 50, 70, and 90 from the respective higher multiple of twenty by fractioning the ordinally expressed decade with half, ½. Literally, then, the initial parts of the Old Danish number names for 50, 70, 90, *halfthrithiæ-*, *halffiærde-*, *halffæmtæ-*, mean ›half-third‹, ›half-fourth‹, and ›half-fifth‹, respectively.[33] Basque possesses no similar expedient for expressing its odd decades.

Order of addends and augends and the use of linking elements in addition

In both Old Danish and Basque, digits and teens are added to decades by means of overt linking elements. In Danish, this element is most commonly the conjunction *oc* ›and‹, but the preposition *til* ›to‹ occurs as well. Basque, as we have seen, employs *-ta*, a shortened form of the conjunction *eta* ›and‹. In Danish, addends are placed to the left of their augends, in Basque to the right. Thus, the number 50 is occasionally rendered as *ti oc … firtiwæ*, 10+(4•10) in Old Danish, but in Basque as *berrogeita hamar* (||20)+10.

The expression of multiplication in numerals

Both Old Danish and Basque handle the operation of multiplication in numerals in partly varying ways. To express the decades 50–90, Old Danish normally inserts an overt multiplication marker, most commonly the nom.-acc. sg. *sin* or dat. sg. *sinni* ›times‹, but from about 1400 also the secondary forms *sinz*, *sinds*, *sins*, *sinnes*, *sinnis*, etc.[34] Also the dat. pl. *sinnom* occurs, particularly in Scanian sources:[35]

50	halff trediesynnom tyughe	(½ 3rd)×20
90	halffemte synnom thyue	(½ 5th)×20

32 HEUSLER: 1964, 86.

33 E.g., ROSS and BERNS: 1992, 612; BECKER-CHRISTENSEN: 1999, 553.

34 *GDG*, 207, 219–220., 292–293.; ROSS and BERNS: 1992, 612.

35 *GDG*, 220.

The semantic ambiguity, i.e., either 10 or 20, of *-tiughu*, *-tiugh*, *-tighi*, etc., that results from the first syllable loss referred to above, is partly remedied by the use of the multiplication marker *sin*(*ni*) to connote the latter sense, thus *fyrisintiughu* with *sin* = 80 (i.e., 4×20) as opposed to *fyritiughu* without *sin* = 40 (i.e., 4•10). Nevertheless, forms such as *thry tiugh* = 60, where *tiugh*(*æ*) without *sin* means 20, do occur at times.[36] More importantly, the multiplication element may be missing with half nth formations, as shown by the following examples involving the decades 50 and 70:[37]

50	halfthrithiæ tiugh half thretyæ tywgh	(½ 3rd)•20	70	half fiærthæ tiwgh halffyærthæ tiwo	(½ 4th)•20

With 80, vigesimal counting without *sin(ni)* is probably a corrupt rendering in the sources according to Brøndum-Nielsen.[38] With 90, it is not at all attested.[39] Besides, the notion n× is in vigesimally-based numerals sometimes expressed by the multiplicative adverbs *tyswar* ›twice‹ (rarely) and *thryswar* ›thrice‹. Finally, multiplication by means of *sinni* is also found with the base 10 as in *fyresynne ty* (4×10) for ›forty‹ and *syw synne thy* (7×10) for ›seventy‹.[40]

Modern Standard Basque, on the other hand, inserts no overt multiplication marker in the formation of the decades 40 *berrogei*, 60 *hirurogei*, 80 *laurogei*; only the order multiplier before multiplicand indicates the operation. Nevertheless, some varieties of Basque do mark the multiplicative operation explicitly, namely, by means of the locative (or inessive) case in *-n*. The main function of this case is to express position in place and time, e.g., *Bilbo-n* (Bilbao–LOC) ›in Bilbao‹, *mendi-e-ta-n* (mountain–ODP–TA–LOC) ›in/on the mountains‹, *oporr-e-ta-n* (vacation–ODP–TA–LOC) ›during the holidays‹.[41] To render multiplication in numerals, the definite plural locative ending *-etan* (or a corresponding variant) is employed, e.g., in Labourdin[42] or north-eastern Souletin (Zuberoan) Basque:[43]

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36 Ibid., 207, 215, 218.

37 Ibid., 213, 216.

38 Ibid., 217.

39 Ibid., 218.

40 Ibid., 213, 219.

41 ODP oblique definite plural, TA plural local case (locative, ablative, allative, etc.), and LOC ›locative‹. On the analysis of the ending *-etan*, see HUALDE and ORTIZ DE URBINA: 2003, 185; HUALDE et al.: 1994, 92–93.; and TRASK: 1997, 204.

42 HOUGHTON: 1961, 24.

	Labourdin Basque	*Souletin Basque*	
60	hiruetan hogoi	hiútanógei	3×20
70	hiruetan hogoi ta-hamar		(3×20)+10
80	lauetan hogoi	lautanógei	4×20
90	lauetan hogoi ta-hamar	lautanoi-ta-hámar	(4×20)+10

In like manner, Azkue notes that »[f]uera de los dial[ectos] B[izkainos] y G[uipuzkoanos] se dice *hiruetan hogoi*, *lauetan hogoi*, literalmente en tres (veces) veinte, en cuatro (veces) veinte«.[44] Hence, while Standard Basque stands a bit apart, Old Danish and northern and eastern Basque are alike in preferring an explicit marker of multiplication, but they differ in its instantiation, Danish employing a full lexeme, which is eventually reduced to a derivational morpheme, and northern/eastern Basque using a case ending.

Additive series 1–9 or 1–19 with twenty-based numerals

As we have seen, Basque constructs the even decades 40, 60, 80 by means of a simple doubling or multiplication of the base twenty. The odd decades 30–90 result from the serial counting 1–19 departing from the respective next-lower even decade. In Old Danish, the situation is more complex. Most commonly, digits from the series 1–9 are added to fixed decimal points, but the additive series 1–19 occurs as well. Brøndum-Nielsen notes that beside the 1–9 system »there often appears a manner of calculation that connects on to the special score-counting such that the number of units proceeds from 10 to 19, especially with full score numbers«.[45] Similarly, »[i]n the score system, the full score numbers are the milestones in the series such that, sometimes, for the half-score numbers the designation *ti oc* (or *til*) *tiughu* [10+20], *ællivu oc tiughu* [11+20], etc. is

43 LARRASQUET: 1934, 85. Similarly, MISPIRATZEGUY: n.d., 119: 60 *hiruretan–hogei*, 70 *hiruretan-hogei'ta-hamar*, 80 *lauretan-hogei*, 90 *lauretan-hogei'ta-hamar*, although in the dictionary part of his work, he gives the forms *[h]irurhogei* and *[l]aurhogei* for 60 and 80, respectively (ibid., 95, 85). LARRASQUET: 1934, 85, does not provide the form for 70.

44 AZKUE: 1969, 2:445. The ending *-etan* is also attested in forming the hundreds 400–900. AZKUE: 1969, 2:446, observes that, instead of using *laureun* (i.e., 4•100), *bortzeun* (5•100), *zazpireun* (7•100) and so on, »[l]os vascos orientales, desde *lau* en adelante, añaden *-etan* al numeral que recibe la centena: *lauetan ehun*, *bortzetan ehun*, *zazpietan ehun* … etc.«. Illustrations of this usage are given in *DGV*, e.g., *DGV*, 5:541.

45 *GDG*, 228.

used (as still in certain dialects…)«.[46] Additional instances with full score numbers are:[47]

n+20:	31	xi [Roman figure 11] och tiwæ	11+20
	34	fiorthen oc tywæ	14+20
	38	attan oc tiwffue	18+20
n+40:	50	ti … oc firtiwæ	10+(4•10)
	52	tolff oc fyrretiffue	12+(4•10)
n+60:	73 *or* 74	tretten eller fiorten och triesindztiffue	13 *or* 14+(3×20)

Interestingly, this usage »rarely [occurs] with half-score numbers (possibly only with the half-hundred-number: 50)« as in:[48]

n+50:	60	ty oc halftrediæsinztyuæ	10+((½ 3rd)×20)
	63	thrætthen oc halftrediæsinztyuæ	13+((½ 3rd)×20)

With the full vigesimal numerals, this pattern was also present in recent Scanian and Jutland dialects.[49] Analogous formations have been attested in Faroese, which, as we know, has borrowed some of its numerals from Danish. Hammershaimb reports that in some Faroese districts combinations of the type 33 *trettan og tjúgu*, i.e., 13+20, 75 *fimtan og trýsinstjúgu*, 15+(3×20), 98 *átjan og fýrsinstjúgu*, 18+(4×20), etc., were once current.[50]

Ranges of vigesimal counting in the Old Danish and Basque decade series

For numerals up to 100, an idealized twenty-based system without intrusions of any other kind of counting would have the structure of Figure 1.

20	2×**20**	3×**20**	4×**20**	5×**20**
1 ……19	1……19	1……19	1……19	1……19

Fig. 1: A hypothetical, pure vigesimal system for the numeric range up to 100. First line shows the base 20 (in bold) with multiples, second line the additive numeration 1…19.

46 Ibid., 208.

47 Ibid., 228–229.

48 Ibid., 229.

49 Ibid.

50 HAMMERSHAIMB: 1891, XCV.

The vigesimally-based numerals in the first line of Figure 1 serve as the fixed points, to which other numbers – the addends – are attached. The additive numeration 1–19 of the second line is postulated to be drawn from a set of mutually distinct stems or root morphemes. As has emerged from the previous sections of this paper, both Old Danish and Basque deviate from such an idealized system, but in different ways, as Figure 2 illustrates.

(a) *Later Old Danish* (main pattern only)

20			(½ 3rd)×**20**	3×**20**	(½ 4th)×**20**	4×**20**	(½ 5th)×**20**	**100**
10	3•**10**	4•**10**						
1…//…19	1…9	1…9	1…9	1…9	1…9	1…9	1…9	1…9

(b) *Modern Standard Basque*

20	‖**20**	3•**20**	4•**20**	**100**
10	**10**	**10**	**10**	**10**
1…/…19	1…/…19	1…/…19	1…/…19	1…/…19

Fig. 2: The conflation of vigesimal and decimal counting in later Old Danish (main system) and Standard Basque. First line represents vigesimally-formed, second line decimally-formed, cardinals, third line additive series. The notation 1…/…19 denotes a succession of cardinals in which the teens 11–19 are composite forms all deriving directly from the simplex words 1–10 (problem of Basque *hamaika* disregarded here), whereas 1…//…19 is a series in which the row of teens includes certain opaque members. Shading indicates some major points of disagreement between the Old Danish and Basque vigesimal/decimal systems.

In particular, Figure 2 underlines the fact that – excepting the infrequent formation *tysuær tiugh* {2×}20 – vigesimality in Old Danish embraces a more restricted decade range, 50–90, than in Standard Basque (20–90).

Twenty-based counting beyond the decades

In Old Danish, vigesimal counting procedes beyond the decades to the early hundreds. Brøndum-Nielsen observes that »in rather formulaic style (legal, poetic, with coin, measure and goods units), score counting with *sin*(*ni*) (*sinz*, also the dative *sinnom* …) as a linking element can be found with numbers over 90, particularly in full score numbers«.[51] Examples include:[52]

51 *GDG*, 219.

52 Ibid., 219–220.

100	femsynnætyffwæ	5×20
	femsynnomtiwffwe	5×20
120	sexsinne tiuæ	6×20
140	sywsynne tywe	7×20
150	halff ottende synne tiwghw	(½ 8th)×20
160	otthesindstiuge	8×20
170	halff nyende synne xx	(½ 9th)×20
180	nisintywæ	9×20
220	eloff synnestywe	11×20
340	søtthensindstywe	17×20

In Modern Standard Basque, the normal practice is not to count vigesimally above 99. Regionally, however, vigesimal cardinals above 99 formed by means of *-etan* do occur:[53]

100	bortzetan hogoi	5×20	160	zortzietan hogoi	8×20
120	seietan hogoi	6×20	180	bederatzitan hogoi	9×20

The full range of vigesimality in the linguistic varieties discussed may then be summed up as in Table 4. To bring out the Old Danish and the Basque situation in full relief, Scottish Gaelic, Breton (19th–20th century dialects), Old and Modern French, and Modern Faroese are added.[54]

Contrasting the varying scopes of vigesimality, we see, at one extreme, Scottish Gaelic, certain traditional varieties of Breton, and Old French with a very extensive range, at the other extreme, Modern Danish, Faroese, and, quite especially, Modern French with much more limited ranges. Old Danish, Labourdin/Low-Navarrese, and Standard Basque are situated somewhere in between.

Concluding remark

At the latest by the end of the 13th century, written Old Danish had begun to develop a mixed decimal-vigesimal numeral system, unrecorded elsewhere in medieval Scandinavia. In Atlantic Europe at large, vigesimality

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53 LAFITTE: 2001, 77; *DGV*, 4:363, 5:541. On the neologism *bostogei*, *borzogei* 5•20, see *DGV*, 5:543 as well as AZKUE: 1969, 2:445, who says: »Las cuatro veintenas son: 20 … 40 … 60 … 80 … Aquí terminan las veintenas. Es rarísimo oír hablar de *bostogei* en vez de *eun* ciento.«

54 On vigesimality in the remaining modern Celtic languages, see, besides GREENE: 1992, for Modern Irish Ó DOCHARTAIGH: 1992, 77–78., on Manx THOMSON: 1992, 113, Welsh THOMAS: 1992b, 295–296.; and Cornish THOMAS: 1992a, 354.

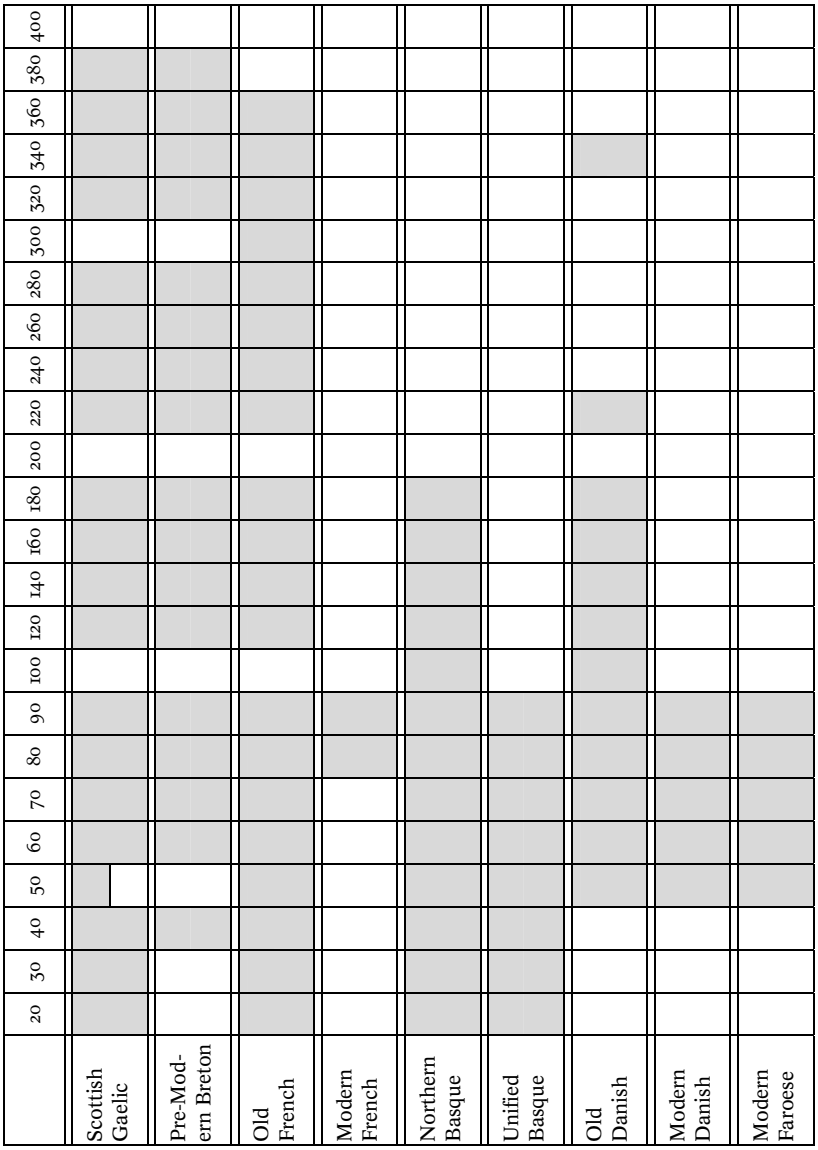

Table 4: 20-based numerals (shaded) in six European languages as indicated by sources cited here. The upper limit of vigesimality in traditional Breton is variously given as 180 (199), 240 or 399. Some vigesimal lacunae in the lower hundreds of Old Danish probably reflect accidental gaps in the data. Also, see next page, Note on Table 4.

Note on Table 4: **Scottish Gaelic** examples of vigesimally-based cardinals: 40 *dà-fhichead*, i.e., 2•20, 50 *dá fhichead agus a deich* (2•20)+10 (but also the non-vigesimal *leth-cheud* ½ 100), 60 *trì-fichead*, 80 *ceithir fichead*, 120 *sia fichead*. »Score counting continues up to 399 but not beyond: that is, **fichead fichead* is not possible but *naoi fichead deug agus a naoi deug* (19 score and 19) is. ›Hundred‹, 200 etc. would normally be *ceud*, *dà cheud* etc.«.[55] **Breton**: 40 *daou-ugent* 2•20, 60 *tri-ugent*, 70 *dek ha tri-ugent* 10+(3•20), 80 *pevar-ugent* 4•20, 90 *dek ha pevar-ugent*, 120 *c'hwec'h-ugent* 6•20, 140 *seizh-ugent* 7•20, 160 *eizh-ugent* 8•20, 180 *nav-ugent*, 220 *unnek-ugent*, 240 *daouzek-ugent*, but 30 *tregont*, 50 *hanter-kant*, i.e., ½ 100, *kant*, 200 *daou c'hant*, etc., are decimally based.[56] »From ›60‹ to ›199‹ inclusive Breton may use the vigesimal system«, however, »vigesimal 120–199 are increasingly rare«.[57] »En breton on utilise la numération *vicésimale* (par vingtaines) jusqu'à 180, parfois jusqu'à 240«.[58] »[S]ome dialects still retain the vigesimal system up to ›three hundred and ninety-nine‹«.[59] »Komposita mit *ugent* 20 existieren über 100 praktisch nur noch in der Erinnerung älterer Sprecher«.[60] **Old French** vigesimal cardinals: 30 *vint et dis*, 40 *deus vins*, 60 *trois vins*, 70 *trois vins et dis*, 80 *quatre vins*, 90 *quatre vins et dis*, 120 *sis vins*, 140 *set vins*, 160 *huit vins*, 180 *neuf vins*, 220 *onze vins*, 240 *douze vins*, 280 *quatorze vins*, 300 *quinze vins*, 320 *seize vins*, 340 *dis set vins*, 360 *dis huit vins*.[61] **Faroese** (borrowed decades): 50 *hálvtrýss*, 60 *trýss*, 70 *hálvfjerðs*, 80 *fýrs*, 90 *hálvfems* (with the older forms 50 *hálvtrýsinstjúgu*, 60 *trýsinstjúgu*, 70 *hálvfjerðsinstjúgu*, 80 *fýrsinstjúgu*, 90 *hálvfemsinstjúgu*).

shows up in all the later Celtic languages, in Old French – at first in 12th century Anglo-Norman texts[62] –, to some extent in Faroese, which has in the modern era borrowed its vigesimal numerals from Danish, and in Basque, whose vigesimal system may be original, even though the late Basque textual evidence itself (starting from the 16th century only) yields little definitive clue as to the early medieval situation.[63] This paper con-

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55 MACAULAY: 1992b, 198.

56 PRESS: 1986, 87–88.; TERNES: 1992, 420–421., and pers. com.; TRÉPOS: 1980, 124.

57 PRESS: 1986, 86, 88, respectively.

58 TREPOS: 1980, 124.

59 GREENE: 1992, 550.

60 Elmar Ternes, pers. com.

61 NYROP: 1924, 363; also quoted in PRICE: 1992, 464.

62 PRICE: 1992, 466.

63 In the related Aquitanian, attested through personal names and theonyms in 1st–3rd century Latin inscriptions of southwestern Gaul, only the numeral elements *lau* and *bost* show up: »En el campo semántico de los numerales se atestiguan *Laur–*, *Bors–*, relacionados respectivamente con vasc. *lau*(*r*), ›cuatro‹, y *bortz* (occ. *bost*), ›cinco‹. Corresponden aproximadamente a los latinos *Quārtus* y *Quīnctus* (dentro de una serie mayor de ordinales: Prīmus, Secundus, Sextus, etc.)« (GORROCHATEGUI CHURRUCA: 1984, 364; see also ibid., 360–361.).

trasts, from a descriptive-typological point of view, the gradually evolving Late Old Danish usage with the relatively coherent system of the primary literary forms of Basque, especially Modern Standard Basque (*euskara batua*). The inventories of cardinals in these two languages are characterized, inter alia, by the features indicated in Table 5.

Generally, the numeral systems of Late Old Danish and Basque agree in exhibiting mixed decimal-vigesimal counting. Nonetheless, they differ considerably with regard to details. Whereas, in Basque, the whole decade range 20–90 is consistently vigesimal, Old Danish normally employs the base 10 for the decades up to 40 and the base 20 essentially only for the decade stretch 50–90. Both languages extend 20-based counting beyond 99, but for Basque this holds true only of regional varieties and for a more restricted stretch than Old Danish. To construct the uneven decades 50, 70, 90, Danish employs the Germanic ½nth device, which is foreign to Basque. In additive constructions, Old Danish puts addends before augends (1+20, etc.), while Basque does the reverse (20+1). Overt addition markers are, however, employed in both languages. In multiplicative constructions, as is common in languages, Old Danish and Basque agree in placing multiplier before multiplicand (3×20). With vigesimal numbers, Old Danish, for the most part, and Labourdin/Low-Navarrese, at times, but not Standard Basque, utilize explicit multiplication markers. The Danish marker is the lexical formative *sin*, literally ›time‹, not seldom inflected in the dative, and from about 1400 often used in secondary forms; in Labourdin/Low-Navarrese, the definite plural locative or inessive ending *-etan* fulfills the same function. Besides, in Old Danish, the overt multiplication marker is sometimes employed with the base 10. Diverging word-formation and lexical resources of the two languages account for the Basque use of the duplicative prefix *berr-* in 40 and the occasional Danish recourse to the multiplicative adverbs *tyswar*, *thryswar* to form 40 and 60, respectively. In Old Danish, the standard additive series is 1–9, yet also 1–19 is found; in Basque, so to speak by definition (composition of uneven decades), only 1–19 occurs. In sum, in the two languages, the same basic idea, vigesimality, is embedded in rather dissimilar structural contexts. Structurally-typologically, in view of these differing intermingling patterns, the numeral systems of Old Danish and Basque constitute only a moderately close match.

		Old Danish	*Basque*
Numerals	1–19	Decimal (11 and 12 opaque)	Decimal
	20–40	Decimal	Vigesimal
	50–90	Originally decimal. Later vigesimal	
	Lower hundred(s)	Decimal. Sometimes vigesimal	Decimal. Regionally, vigesimal
Use of morpheme ›half‹ plus ordinal (n^{th}) to form uneven 20-based decades		Yes	No
Additive series 1–19 with even 20-based decades		Sometimes	Yes
Additive series 1–19 with uneven 20-based decades		Marginally attested with 50	No (odd decades always emerge by addition to even decades)
Order of addends 1–9 or 1–19 and decades 20–90 in addition		Addends before decades	Decades before addends
Overt addition marker (+) with 20		Yes (conjunction *oc* ›and‹, sometimes preposition *til* ›to‹)	Yes (*-ta* < *eta* ›and‹)
Order of multipliers and multiplicands in numerals formed by multiplication		Multipliers before multiplicands	Multipliers before multiplicands
Overt multiplication marker (×)		Nom.-acc. sg. *sin*, dat. sg. *sinni*, dat. pl. *sinnom*, secondary forms *sinz*, *sinnis*, etc. (sometimes Ø)	Normally Ø, but the definite plural locative ending *-etan* ›times‹ used regionally
Overt multiplication marker with 10, i.e., n×10 instead of n•10		Occasionally (e.g., *fyre synne ty* 4×10 beside *fyritiughu* 4•10)	–
Use of notion ›double n‹ (‖n) with bases 20 and 100		No (40 for the most part decimally expressed)	Yes, prefix *berr-* ›re-‹
Occasional use of special multiplicative adverbs ›twice, thrice‹ (rather than ›two, three times‹) in forming the numerals 40, 60		Adverbs *tyswar* {2×}, *thryswar* {3×}, the latter corresponding to the phrase *thrysin*(*ni*) 3×	No number-forming adverb distinct from the definite plural locative ending *-etan*

Table 5: Selected features of the formation of Old Danish and Modern Basque numerals

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